Java Monitor Objects:
Evaluating Synchronized Methods

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Learning Objectives in this Part of the Lesson

• Recognize the synchronized methods/statements provided by Java build-in monitor objects to support *mutual exclusion*

• Understand how to fix race conditions in the buggy concurrent Java app by using synchronized methods

• Evaluate the pros & cons of applying Java synchronized methods to the BusySynchronizedQueue
Evaluating the Busy SynchronizedQueue
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- Applying Java synchronized methods to BusySynchronizedQueue certainly fixed the race condition problems in BuggyQueue

See earlier lessons on "Java Monitor Objects: Motivating Example"
Evaluating the BusySynchronizedQueue

• However, Java synchronized methods can be limited when used in isolation.

See [github.com/douglascraigschmidt/POSA/tree/master/ex/M3/Queues/BusySynchronizedQueue](https://github.com/douglascraigschmidt/POSA/tree/master/ex/M3/Queues/BusySynchronizedQueue)
• However, Java synchronized methods can be limited when used in isolation

class BusySynchronizedQueue<E> implements SimpleBlockingQueue<E> {
    private ListedList<E> mList;
    private int mCapacity;

    public BusySynchronizedQueue(int capacity) {
        mCapacity = capacity; mList = new LinkedList<>();
    }

    public synchronized boolean offer(E e) {
        if (!isFull())
            { mList.add(e); return true; } else
            return false;
    }

    public E synchronized poll() { return mList.poll(); }
    ...

See en.wikipedia.org/wiki/Busy_waiting
Evaluating the BusySynchronizedQueue

• However, Java synchronized methods can be limited when used in isolation

```java
class BusySynchronizedQueue<E> implements SimpleBlockingQueue<E> {
    private List<LinkedList<E>> mList;
    private int mCapacity;

    public BusySynchronizedQueue(int capacity) {
        mCapacity = capacity; mList = new LinkedList<>();
    }

    public synchronized boolean offer(E e) {
        if (!isFull())
            { mList.add(e); return true; }
        else
            return false;
    }

    public E synchronized poll() { return mList.poll(); }
    ...
```

Need to coordinate offer() & poll() so they won’t busy wait when there’s nothing to do
Evaluating the BusySynchronizedQueue

- To avoid busy waiting, therefore, Java monitor objects provide “wait” & “notify” mechanisms

See upcoming lesson on “Java Monitor Objects: Coordination Methods”
End of Java Monitor Objects: Evaluating Synchronized Methods